IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : JOHNSON et al.
Serial No. : 10/535,296
Confirmation No. : 5856
Filed : 5/17/05
T.C./ Art Unit : 2629
Examiner : CHOW, YUK
Title: METHOD OF IMPROVING THE OUTPUT UNIFORMITY OF A DISPLAY DEVICE

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APPEAL BRIEF
On Appeal from Group Art Unit 2629

By: E. Weiss
Eli Weiss
Attorney for Appellant
Reg. No. 17,765
For: Larry Liberchuk
Reg. No. 40,352
Senior IP Counsel
Philips Electronics N.A. Corporation

Date: September 4, 2008

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I. REAL PARTY IN INTEREST

The real party in interest is Philips Electronics N.A. Corp. the assignee of record.

II. RELATED APPEALS AND INTERFERENCES

Applicant is not aware of any pending appeals, judicial proceedings, or interferences which may be related to, directly affect, be directly affected by, or have a bearing on the Board's decision In the pending appeal.

III. STATUS OF CLAIMS

a) Claims 1 – 20 are pending.

b) Claims 1 – 20 stand rejected and are the subject of this appeal.

c) Claims 1, 13 and 15 are independent.

IV. STATUS OF AMENDMENTS

The claims listed in Section "VIII. Claims Appendix" of this Appeal Brief correspond to the claims as listed and submitted in Appellant's response of January 7, 2008. A final Office Action rejecting claims 1 – 20 was mailed on April 9, 2008. No claim amendments have been submitted by Appellant subsequent to the final Office Action of April 9, 2008, nor are any claim amendments pending.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The claimed invention as recited in claim 1, is directed to a method of improving the output uniformity of a display device (PreGrant Pub., par. [0001] lines 1-2; par.[0008] lines 2-3]) comprising:

detecting a first emitted brightness of at least one pixel of the display device via an external detection system that is substantially independent of the display device (par.[0008] lines 4-5, par. [0010] lines 2-5; and par. [0027] lines 1-6);

determining the non-uniformity of an output of a driver circuit connected with the at least one pixel based on the first emitted brightness (par. [0027] lines 9-14);

generating a calibration factor for the at least one pixel based on the non-uniformity to be used to modify the output of the driver circuit to improve the uniformity (par. 0027] lines 9-23); (par. [0030] lines 8-13 and par [0031] lines 1-11) .

The claimed invention, as recited in claim 13 is directed to a system (par. [0010] lines 1-4) comprising:

a unit for holding a display device to be calibrated (par, [0015] lines 4-5),

a detection system that is substantially independent of the display device and configured to detect emitted brightness from the entire display device surface of the display device (par. [0015] lines 6-7), and

a feedback system that is configured to communicate information based on the emitted brightness to the display device to facilitate improvement of output brightness uniformity by adjustment of one or more drivers of the display device (par. [0015] lines 710).

The claimed invention as recited in claim 15 is directed to a display device that is configured to receive information based on an emitted brightness of one or more pixels of the display device from an external detector that is independent of the display device (par. [0056] lines 1-4) par. [0058] lines 8-10) , and includes at least one component of at least one driver that is adjusted based on the information to improve an output brightness uniformity of the display device (par. [0058] lines 8-10).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 1 – 15, 18 and 20 are properly rejected under 35 U.S.C. 103(a) as being unpatentable over Tanada (US 2002/0047550 A1) in view of Salam (US Patent 6,329,758).

Whether claim 16 is properly rejected under 35 U.S.C. 103(a) as being unpatentable over Tanada (US 2002/0047550 A1) and Salam (US Patent 6,329,758) in further view of Hack et al., (US 2003/0030647 A1).

Whether claims 17 and 19 are properly rejected under 35 U.S.C. 103(a) as being unpatentable over Tanada (US 2002/0047550

A1) and Salam (US Patent 6,329,758) in further view of Henson (US Patent 6,133,054).

VII. ARGUMENT

Appellants respectfully traverse the rejections in accordance with the detailed arguments set forth below.

A. Claims 1 – 15, 18 and 20 are not properly rejected under 35 U.S.C. 103(a) as being unpatentable over Tanada (US 2002/0047550 A1) in view of Salam (US Patent 6,329,758).

As noted in Applicants PreGrant Publication (which corresponds to the application as filed), paragraph [0004], a problem with active matrix polymer light emitting diode displays using Thin Film Transistors (TFT) is that variations of the characteristics of such transistors result in a random pixel-to-pixel variation of the brightness of the display which causes non-uniformity of the display output. The present invention relates to varying the charge on the storage capacitor of the pixel driver circuit to compensate for variations in transistor characteristics. Referring to Figures 2 and 3, and paragraph [0024] of Applicants PreGrant Publication, the selection of a row takes place by means of the row selection circuit 16, via the gate electrodes of transistors 22 and row lines 8, by providing them with the required selection voltage. Writing data takes place in that, during selection, data signals are provided from the data register 15 in the form of voltage signals. During addressing, a capacitor 24 is charged to the level of the data voltage via the transistors.

This capacitor determines the adjustment of the transistor 21 and hence the actual current through the LED 20 during a driving period and the luminance of the pixel. Referring to paragraph [0027], lines 1-4, each pixel has "...a brightness depending on an output signal 4 to the driving circuit 3...". And, referring to lines 9-14 "... the detected brightness is compared with a desired brightness for the output signal 4 in question, and the display non-uniformity of that specific output signal 4 may be established by signal processing. Therefore, as required, the output signal 4, and hence the emitted brightness is adjusted and the above detection is repeated, one or more times..."(underscoring added)

Thus, in Applicants invention, the charge on the capacitor determines the brightness of the pixel. Therefore, to change the brightness of the pixel, the charge on the capacitor is changed.

1. Claim 1

The arguments presented below have not been previously presented for consideration by the Examiner or considered by the Examiner.

The Examiner states that Tanada discloses a method of improving the output uniformity of a display, comprising the following steps:

determining the non-uniformity of an output of a driver circuit connected with the at least one pixel base on the first emitted brightness (see [0119]);

generating a calibration factor (Fig. 2C(B2)) for the at least one pixel based on the non-uniformity, to be used to modify the output of the driver circuit (Fig. 1(111)), to improve the uniformity.

As noted above in the summary Applicants invention, the charge on the storage capacitor is fed through the pixel as a single pulse and the brightness of the pixel is determined by the magnitude of the charge on the storage capacitor. Thus, to control the brightness of a pixel, Applicants first place a specific electrical charge on the storage capacitor, and then feeds this charge which is on the capacitor through the pixel as a single pulse.

In Tanada, the charge on the storage capacitor is constant, it is not changed. To vary the brightness of the pixel, the pixel is pulsed a specific number of times during a specific interval of time. The brightness of the pixel is increased as the number of times that it is pulsed is increased. See paragraph [0018] lines 1-6 where it is stated that "As a gray scale display method, the brightness is controlled by the sum of all the sustain (turn on) periods within one frame period in accordance with controlling which subframe periods the EL elements are turned on, and which subframe periods the EL elements are not turned on in the sustain (turn on) periods from Ts1 to Ts3".

Thus, contrary to the Examiners assertion, Tanada does not disclose or suggest, "...modifying the output of the driver circuit ..." as is positively recited in Applicants Claim 1. What Tanada does disclose is keeping the output of the driver circuit constant and pulsing the pixel a specific number of times to control the brightness of the pixel.

Applicants agree with the Examiner's statement that Tanada does not teach detecting a first emitted brightness of at least one pixel of the display device via an external detection system that is substantially independent of the display device. The Applicants also agree that Salam discloses an external detection system that is substantially independent of the display device. But, it is noted that the structure of Salam is similar to that of Tanada where the lamp brightness is controlled by pulsing each lamp a predetermined number of times during each period. See column 2, lines 31-33 where it is stated that, "The control system alters the brightness of each lamp individually by altering the proportion of time for which a register bit that selects the lamp is set". And in column 3, lines 52-54 where it is stated that, "Thus the proportion of time for which a bit in register 8 is set to select a lamp determines the brightness of the lamp".

As noted above, in Applicants invention, the charge on the capacitor determines the brightness of the pixel. Therefore, to change the brightness of the pixel, the charge of the capacitor is changed which determines the brightness of the pixel, not the number of times that the pixel is pulsed.

Clearly, claim 1 avoids the art cited by positively reciting, in combination, the step of, "...generating a calibration factor for the at least one pixel based on the non-uniformity to be used to modify the output of the driver circuit to improved the uniformity..." (underscoring added). Accordingly, independent claim 1 avoids Tanada in view of Salam.

2. Claims 2-12, 17 and 18

Claims 2-12, 17 and 18 depend from claim 1 with varying degrees of restrictiveness and, for the reasons set forth above for claim 1, are also believed to be patentable over the cited art. Therefore, dependent claims 2 - 12, 17 and 18 stand or fall together with independent claim 1.

3. Claim 13

Independent Claim 13 recites the structure of, "... a feedback system that is configured to communicate information based on the emitted brightness to the display device to facilitate improvement of output brightness uniformity by adjustment of one or more drivers of the display device...". (underscoring added for emphases).

As noted above, in the references cited by the Examiner the potential on the storage capacitor is not changed. What is changed is the number of times that the pixel is pulsed during a specific time interval. In Applicant's invention, it is the charge on the storage capacitor of the driver which is changed, not the number of times that the pixel is pulsed. Accordingly, independent claim 13 clearly avoids the references cited.

4. claim 14

Claim 14 depends from claim 13 and, for the reasons set forth above for claim 14, is also believed to be patentable over the cited art. Therefore, dependent claim 14 stands or falls together with independent claim 13.

5. Claim 15

As noted above, the references cited disclose that the brightness of the pixel is controlled by pulsing the pixel a specific number of times during a set interval of time. The references do not disclose or suggest adjusting the charge on the capacitor to control the brightness of the pixel. In Applicant's invention, it is the charge on the storage capacitor in the driver which is adjusted to control the brightness of the pixel. It is not the number of times that the pixel is pulsed. Independent claim 15 recites the structure of "A display device ... includes at least one component of a least one driver that is adjusted based on the information to improve an output brightness uniformity of the display device" (underscoring added). Accordingly, independent claim 15 clearly avoids the references cited.

6. claim 20

Claim 20 depends from claim 15 and, for the reasons set forth above for claim 15, is also believed to be patentable over the cited art. Therefore, dependent claim 20 stands or falls together with independent claim 15.

B. Claim 16 is not properly rejected under 35 U.S.C. 103(a) as being unpatentable over Tanada and Salam in further view of Hack et al., (US 2002/0030647 A1)

Claim 16 depends from claim 15 and recites that "... each column or row includes a current measurement device, and a controller that is configured to adjust an output of the data driver

circuit based on a relative change over time of current detected by the current measurement device".

Hack discloses adjusting the pixel brightness by using a single voltage pulse at a given amplitude, through a series of pulses with varying amplitudes. See paragraph [0049]. Thus. as noted above, in Hack the charge on the storage capacitor is not adjusted. What is adjusted is the number of pulses and the amplitude of the pulses fed to the pixel during an interval of time. In Applicant's invention, and as recited in the claim, it is the charge on the storage capacitor of the driver which is adjusted, not the number of times that the pixel is pulsed. Accordingly, dependent claim 16 avoids Tanada and Salam in view of Hack.

C. Claims 17 and 19

Claims 17 and 19 are not properly rejected under 35 U.S.C. §103(a) as being unpatentable over Tanada (US 2002/0047550 A1) and Salam (US Patent No. 6,329,758) in further view of Henson (US Patent 6.133.054).

Claim 17 depends from independent claim 1 and claim 19 depends from independent claim 15. For the reasons noted above for independent claims 1 and 15, dependent claims 17 and 19 clearly avoid Tanada and Salam in view of Henson.

CONCLUSION

For the foregoing reasons, the final rejection of claims 1-20 should be reconsidered by the Examiner or reversed in its entirety by the Board. Claims 1-20 are patentable over the prior art of record.

Accordingly, the Examiner's finding of unpatentability should be reversed. Such a disposition is earnestly solicited.

Dated: September 4, 2008

Respectfully submitted,

By _____
Eli Weiss
Attorney for applicant
Reg. No. 17,765
For: Larry Liberchuk
Reg. No. 40,352

Please direct all future correspondence to:
Larry Liberchuk, Esq.
Senior IP Counsel
Philips International Property & Standards
P.O. Box 3001
Briarcliff Manor, N.Y. 10510-8001

APPENDIX

1. (Previously Presented) A method of improving the output uniformity of a display device comprising:

detecting a first emitted brightness of at least one pixel of the display device via an external detection system that is substantially independent of the display device;

determining the non-uniformity of an output of a driver circuit connected with the at least one pixel based on the first emitted brightness;

generating a calibration factor for the at least one pixel based on the non-uniformity to be used to modify the output of the driver circuit to improve the uniformity.

2. (Previously Presented) The method of claim 1, wherein the display device is a self light emitting display device.

3. (Previously Presented) The method of claim 1 or 2, wherein the display device is an organic light emitting diode based display device.

4. (Previously Presented) The method of claim 1, including:

adjusting an average display brightness,

detecting a second emitted brightness of the at least one pixel and

generating the calibration factor based on the first and second detected brightnesses.

5. (Previously Presented) The method of claim 1, wherein the external detection system includes an external imaging system.

6. (Previously Presented) The method of claim 1, wherein the driver circuit is one of a pixel driver circuit or a data driver circuit.

7. (Previously Presented) The method of claim 1, wherein the display device is an active matrix polymer or organic light emitting diode display device.

8. (Previously Presented) The method of claim 7, wherein detecting the emitted brightness of at least one pixel includes individually detecting the emitted brightness for each of a plurality of pixels.

9. (Previously Presented) The method of claim 7, including aligning, in one of a column or a row of pixels, all transistors of all pixels in a direction of a laser beam during laser recrystallisation during fabrication of the transistors.

10. (Previously Presented) The method of claim 1, wherein the display device is a passive matrix polymer or organic light emitting diode display device.

11. (Previously Presented) The method of claim 1, wherein detecting the emitted brightness of at least one pixel includes jointly measuring an emitted brightness of a group of pixels commonly controlled by a common driving device.

12. (Previously Presented) The method of claim 1, including storing the calibration factors in a memory device associated with the driver circuit.

13. (Previously Presented) A system comprising:

a unit for holding a display device to be calibrated,

a detection system that is substantially independent of the display device and configured to detect emitted brightness from the entire display device surface of the display device, and

a feedback system that is configured to communicate information based on the emitted brightness to the display device to facilitate improvement of output brightness uniformity by adjustment of one or more drivers of the display device.

14. (Previously Presented) A system according to claim 13, wherein the display device is a self light.

15. (Previously Presented) A display device that is configured to receive information based on an emitted brightness of one or more pixels of the display device from an external detector that is independent of the display device, and includes at least one component of at least one driver that is adjusted based on the information to improve an output brightness uniformity of the display device.

16, (Previously Presented) A display device as defined in claim 15, wherein the display device comprises a plurality of light emitting pixels being arranged in a row and column structure, wherein either each column or each row of pixels is connected with a data driver circuit, wherein each column or row includes a current measurement device, and a controller that is configured to adjust an output of the data drive circuit based on a relative change over time of current detected by the current measurement device.

17. (Previously Presented) The method of claim 1, including burning fuses on a circuit associated with the driver circuit.

18. (Previously Presented) The display device of claim 15, wherein the at least one component includes one or more fuses.

19. (Previously Presented) The display device of claim 15, wherein the at least one component includes one or more fuses.

20. (Previously Presented) The display device of claim 15, wherein the at least one component includes one or more transistors that are laser trimmed based on the information.

IX. EVIDENCE APPENDIX

No evidence has been submitted pursuant to §§ 1.130, 1.131 or 1.132 of this title or of any other evidence entered by the Examiner and relied upon by appellant in the appeal.

X. RELATED PROCEEDINGS APPENDIX

Appellant is not aware of any appeals or interferences related to the present application.